REMARKS

In view of the above amendments and following remarks, reconsideration of the objections and rejections contained in the Office Action of September 8, 2004 is respectfully requested.

The Examiner's objection to the drawings is acknowledged. A new drawing Fig. 3 has been added by the above amendments to illustrate the diffraction grating. It is noted that the drawing that is added is the same as Fig. 2, but illustrates a diffraction grating 18 instead of the filter 14. This material is not new matter. The Examiner's attention is directed to lines 5-13 of page 10 of the specification. From this paragraph it is clear that a diffraction grating is employed in place of the filter. The language of the paragraph has been slightly modified to refer to the figure and diffraction grating 18.

The Examiner's objection regarding the acronym PLL has been addressed in the above amendments to the specification.

Further, the Examiner's objection to the claims has been rendered moot by the cancellation of the original claims in favor of new claims 7-10. All of these claims have been drafted so as to provide antecedent basis for limitations employed therein.

The Examiner had rejected claims 1-2 as being anticipated by Morris et al., U.S. Patent 4,591,272 (Morris). Further, claims 4 and 5 were rejected as being unpatentable over Morris in view of Opsal, U.S. Patent 5,074,669 (Opsal) or Rosencwaig et al., U.S. Patent 4,750,822 (Rosencwaig). Claim 3 was rejected as being unpatentable over Morris in view of Hiraga et al., International Patent Publication WO 99/08149 (Hiraga). Further, claim 6 was rejected as being unpatentable over Morris in view of Opsal or Rosencwaig and in further view of Hiraga.

However, it is respectfully submitted that the present invention, particularly as now defined in new claims 7-13, clearly distinguishes over each of Morris, Opsal, Rosencwaig and Hiraga.

One object of the present invention is to provide a desk top thermal lens microscope that is small in size to the extent that detection of a chemical reaction within a glass chip or the like can be preformed at any given place, in a simpler and easier way.

Accordingly, in the desktop thermal lens microscope according to the present invention, as illustrated in Fig.1, all of the components are integrated together into a single housing. As described

on page 6 of the specification, the components basically include an excitation light source system P, a probe light source system Q, an objective lens system R serving as the microscope optical system, a condenser lens system S and a light receiving system T.

Independent claim 7, the only independent claim now pending in the application, recites the desktop thermal lens microscope apparatus of the present invention as comprising a semiconductor laser forming an excitation light source operable to emit excitation light, a chopper positioned to modulate the excitation light, a beam expander, another semiconductor laser forming a probe light source, and a collimator lens positioned to emit the probe light as parallel light-ray beams. Further, a microscope optical system is operable to receive the modulated excitation light as plane waves and the probe light as parallel light-ray beams. The system comprises an objective lens system and has a stage for receiving a specimen thereon. A light receiving system is defined as being positioned to receive the modulated excitation light and the probe light that has passed through the thermal lens.

Further, the claim requires that a single housing be provided, when the excitation light source, the probe light source, the chopper, the beam expander and the collimator lens and the microscope optical system are integrated together in the single housing.

The wording "integrated in a single housing" is defined at page 6 to page 7 of the specification which states on page 7 that "the components . . . need only to be integrated and connected together by means of a structure such as a screwing structure, hanging structure, fitting structure or sliding structure." The wording "integrated in a single housing" means that the components are joined together by a structure of the type listed above. As the components are joined together in this way, their respective vibrations will be carried by that one structure such that only the vibration of the structure needs to be controlled to reduce the distortion of the signals obtained.

The Examiner cited Morris as anticipating independent claim 1. However, Morris neither discloses nor suggests a single housing having the excitation light source, the probe light source, the chopper, the beam expander, the collimator lens and the microscope optical system integrated together therein.

On the contrary, Morris only discloses that "the entire optical system from the prism to fiber was enclosed in an aluminum case." Note column 4, lines 59-61. As can be seen from Fig. 1 of

Morris, the prism is element number 30, and the fiber is element number 42. As such, it appears that in Morris the probe light source and the excitation light source are arranged outside of the aluminum case. There is no discussion of the integration of the probe light source and the excitation light source. Further, it is not clear that the components that are enclosed in the aluminum case of Morris are integrated together in a single housing as claimed.

In Morris, when the probe light source, the excitation light source and other components are separately arranged, each separate component may cause its housing to vibrate, causing a higher degree of noise distortion in the results that are obtained.

It is further noted that independent claim 7 recites the probe light source and the excitation light source as comprising semiconductor lasers. The use of semiconductor lasers is not disclosed by Morris. Such lasers are considerably smaller as compared with the gas lasers such as the argon laser and the He-Ne laser used in Morris.

The recited features of independent claim 7 result in a compact portable desktop thermal lens microscope apparatus that in fact has improved results by mitigation of the influence of noise due to vibrations. The conventional thermal lens apparatus as in Morris is large in size, has a low level of portability and is used only at limited locations. The size of the conventional thermal lens apparatus is, for example, W150cm x D100cm x H80cm, as described in page 11 of the specification. A picture of an example of the conventional type apparatus is shown as attached Fig. A.

The desktop thermal lens microscope apparatus of the present invention is excellent in portability and can be utilized at any given place. The size of the desktop thermal lens microscope apparatus of the present invention is, for example, W30cm x D50cm X H50cm, as described on page 11 of the specification. A picture of an example of the desktop thermal lens microscope apparatus is shown as attached Figure B.

In addition, Fig. C shows thermal lens signals obtained by the apparatus of the present invention and a conventional apparatus like Morris, in the same condition. A lot of noise appeared in the data (b) of the conventional apparatus. Stable signals appeared in data (a) of the apparatus of the present invention.

A further aspect of the present invention lies in the use of the thermal lens microscope. That is, with the present invention, an objective lens of the microscope is used for the formation of the thermal lens. By contrast, Morris uses a normal lens for the formation of the thermal lens.

Fig. D shows working curves derived from the above obtained data. The detection limit of the present invention (FIG. D(a)) is relatively smaller than that of the conventional apparatus (FIG. D(b)). From this data, it is understood that the present invention is excellent as compared to the conventional apparatus like Morris in the sensitivity of the detection.

Optical microscopes have an objective lens through which the sample is viewed, as is well known in the art. These lenses do not provide chromatic aberration. This means that the excitation and probe light of different wavelengths would be focused onto the same point relative to the sample when passing through the objective lens, and so the apparatus of the present invention would not be able to provide accurate measurements if it only included the features disclosed in Morris. The apparatus of the present invention includes the further feature of the beam expander which enables collimation adjustment in the direction of the excitation light path and biaxial centering in the direction perpendicular to the excitation light path to emit the modulated excitation light as plane waves in use. The apparatus of the present invention further comprises a collimator lens which emits the probe light as parallel light ray beams in use. These features ensure that the respective focal depths of the excitation and probe light, on passing through the objective lens, will be difficult even through the lens will act in the same way to light of different wavelengths (see Fig. E). The function of the beam expander of the present invention is quite different from that of a usual collimator. Consequently, the present invention allows a desktop thermal lens microscope apparatus which operates efficiently and is significantly different structurally from the apparatus of Morris.

The present invention solves the problem of forming a thermal lens using an optical microscope in order to allow a miniaturized thermal lens microscope to be produced. It does this by realizing that the objective lens does not cause chromatic aberration, and so provides the additional features of a beam expander to provide the necessary focal adjustment to allow accurate measurements to be made using the thermal lens. Neither this problem not its solution are identified in the prior art.

Accordingly, it is respectfully submitted to be clear that independent claim 7 as newly presented clearly patentably distinguishes over Morris.

Each of Opsal, Rosencwaig and Hiraga were cited in rejection of various of the dependent claims. As all of the dependent claims now presented, claims 8-13, depend, directly or indirectly, from claim 7, All of these claims distinguish over these references for the same reasons as are applicable with respect to claim 7. As such, no further discussion of the further distinctions presented in these claims appears necessary at this time.

It is noted, however that Opsal and Rosencwaig were cited by the Examiner as having a thermal lens microscope system that examines chips. Whether or not this is the case, it is clear that neither Opsal nor Rosencwaig discloses or suggests the single housing as claimed.

Hiraga was cited for the proposition of a diffraction grating. However, whether or not this is the case, Hiraga also does not cure the deficiencies of Morris with respect to independent claim 7.

Accordingly, it is respectfully submitted that all of the claims pending in the present application clearly distinguish over the various prior art references cited by the Examiner. Indication of such is respectfully requested. Further, it is respectfully submitted that the application as a whole is now in condition for allowance, and the Examiner is requested to pass the case to issue.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact Applicants' undersigned representative.

Respectfully submitted,

Takehiko KITAMORI et al.

By: _____

Nils E. Pedersen
Registration No. 33,145
Attorney for Applicants

NEP/krg
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
March 8, 2005

AMENDMENTS TO THE DRAWINGS

Please add accompanying new drawing Fig. 3.